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Characterization and phylogenetic analysis of complete mitochondrial genomes for two desert cyprinodontoid fishes, *Empetrichthys latos* and *Crenichthys baileyi*.

Jimenez M¹, Goodchild SC², Stockwell CA³, Lema SC⁴.

Author information

- 1 Alan Hancock College, Santa Maria, CA, USA; Biological Sciences Department, Center for Coastal Marine Sciences, California Polytechnic State University, San Luis Obispo, CA, USA.
- 2 Department of Biological Sciences, North Dakota State University, Fargo, ND, USA; Environmental & Conservation Sciences Graduate Program, North Dakota State University, Fargo, ND, USA.
- 3 Department of Biological Sciences, North Dakota State University, Fargo, ND, USA.
- 4 Biological Sciences Department, Center for Coastal Marine Sciences, California Polytechnic State University, San Luis Obispo, CA, USA. Electronic address: slema@calpoly.edu.

Abstract

The Pahrump poolfish (*Empetrichthys latos*) and White River springfish (*Crenichthys baileyi*) are small-bodied teleost fishes (order Cyprinodontiformes) endemic to the arid Great Basin and Mojave Desert regions of western North America. These taxa survive as small, isolated populations in remote streams and springs and evolved to tolerate extreme conditions of high temperature and low dissolved oxygen. Both species have experienced severe population declines over the last 50-60 years that led to some subspecies being categorized with protected status under the U.S. Endangered Species Act. Here we report the first sequencing of the complete mitochondrial DNA genomes for both *E. l. latos* and the *moapae* subspecies of *C. baileyi*. Complete mitogenomes of 16,546bp nucleotides were obtained from two *E. l. latos* individuals collected from introduced populations at Spring Mountain Ranch State Park and Shoshone Ponds Natural Area, Nevada, USA, while a single mitogenome of 16,537bp was sequenced for *C. b. moapae*. The mitogenomes of both species contain 13 protein-encoding genes, twenty-two tRNAs, and two rRNAs (12S and 18S) following the syntenic arrangement typical of Actinopterygian fish mitogenomes, as well as D-loop control regions of 858bp for *E. latos* and 842bp for *C. baileyi moapae*. The two *E. latos* individuals exhibited only 0.0181% nucleotide sequence divergence across the entire mitogenome, implying little intraspecific mtDNA genetic variation. Comparative phylogenetic analysis of the poolfish and springfish mitochondrial genomes to available mitogenomes of other Cyprinodontoid fishes confirmed the close relationship of these oviparous *Empetrichthys* and *Crenichthys* genera to the viviparous goodeid fishes of central Mexico, and showed the combined clade of these fishes to be a sister group to the Profundulidae killifishes. Despite several significant life history and morphological differences between the Empetrichthyinae and Goodeinae, estimates of evolutionary genetic distances using two partial regions of mtDNA point to inclusion of the *Empetrichthys* and *Crenichthys* genera within the family Goodeidae along with the goodeid fishes of central Mexico.

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Conservation; Cyprinodontiformes; Desert; Endangered species; Fish; Goodeidae; Pahrump poolfish; White River springfish; mtDNA

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